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POTATO STUDIES.

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BULLETIN 277

POTATO STUDIES

CHAS. D. WOODS

THE FOOD VALUE OF MAINE GROWN POTATOES

ANALYSES OF MAINE GROWN COMPARED WITH OTHER POTATOES

Like all vegetables potatoes are high in water content. The water in foods is no more valuable for nutrition, so far as is known, than other water. Hence the dry matter is the best comparative measure of food materials that are at all similar in composition. Samples of Maine potatoes analyzed at different times by the Maine Station are compared with American analyses of potatoes compiled by the Office of Experiment Stations at Washington in the table that follows.

Table Showing the Analyses of Maine Grown Potatoes Compared with all American Analyses, on Water Content of Fresh Edible Tubers

	Water	Dry matter	Ash	Protein	Carbohydrates and fat*
	%	%	%	%	%
Maine grown	76.7	23.3	0.9	2.2	20.2
All American analyses	78.3	21.7	1.0	2.2	18.5

*The ether extract or "fat" in potatoes is about .1 per cent. The fiber in Maine analyses is .6 per cent and in all American .4 per cent.

The Maine grown potatoes apparently carry rather more than 1½ pounds per hundredweight more dry matter than all of American potatoes. There is little difference in ash, protein and fat content and this extra weight of dry matter is due to higher percentages of the carbohydrates or starchy materials. While most of the carbohydrates are starch, they are not all. The examination of Maine grown potatoes made by this Station show the starch to range from 16 to 21 per cent. As the per cent of starch in potato tubers depends upon their maturity anything that will prolong their growth is likely to increase

the starch content. In years when there is potato blight vines sprayed with Bordeaux mixture will usually outlive unsprayed vines. In the comparison between unsprayed and sprayed from the same fields the tubers from the sprayed portions averaged to carry 19.1 per cent starch and those from the unsprayed only 17.5 per cent. Also the dry matter in the tubers from sprayed portions of the field averaged more than 1½ per cent higher than in the case of those from the unsprayed portions.

Every experiment made at this Station has shown proper spraying with Bordeaux mixture to increase the yield of merchantable tubers, and this has been true even in years in which there was no appreciable blight present. If the per cent and a half more of starch found in the sprayed than in the unsprayed tubers is due to the treatment of the vines, and no other explanation suggests itself, this is an added argument in favor of spraying with Bordeaux mixture.

COMPOSITION AS AFFECTED BY COOKING

From potatoes being used in a feeding experiment two lots of 1000 grams each were selected. One lot was prepared at once for analysis and one lot was steamed until cooked before being prepared. The cooked lot weighed 1022 grams when removed from the steamer, but when cooled in the open air this added water evaporated and they weighed 995 grams or 5 grams less than before being steamed. The raw potatoes carried 24.1 per cent of dry matter and the cooked 24.63 per cent. The 1000 grams of raw potatoes therefore carried 241 grams of dry matter and the 995 grams of steamed potatoes 245 grams. As will be noted the differences are all slight and within laboratory error. The composition on dry basis follows:

Table Showing the Analyses of Raw and Steamed Potatoes From the Same Lot, Calculated to Waterfree Basis (Dry Matter)

	Protein	Fiber	Nitrogen-free extract*	Fat	Ash
	%	%	%	%	%
Raw	10.91	2.30	82.85	.54	3.40
Steamed	10.70	2.78	82.67	.28	3.57

*Nitrogen-free extract includes all of the carbohydrates other than fiber.

The Digestibility of Raw Potatoes and Cooked Potatoes Compared

In a feeding experiment with sheep in which hay and potatoes were fed the following comparisons in digestibility between raw and steamed potatoes were made:

Table Showing the Digestion Coefficients for Raw and Cooked Potatoes When Fed to Sheep

	Dry matter	Organic matter	Protein	Nitrogen-free extract
	%	%	%	%
Raw	76	77	44.6	90.3
Cooked	80	81	43.4	92.1

While the differences are not great in this one trial with 4 sheep the dry matter, the organic matter, and the starch of the nitrogen-free extract was somewhat more completely digesed in the cooked than in the raw potatoes.

The Feeding Value of Raw as Compared With Cooked Potatoes

Two lots of 6 each of pigs of the same breeding, size and apparent thrift, were selected and fed for 44 days with a ration consisting of 15 pounds of potatoes, one pound of corn meal and 4 quarts of milk. With one lot the potatoes were fed raw and to the other the potatoes were steamed before being fed. It was planned to continue this way for 6 weeks and then change the ration so that the pigs that had been getting raw would get cooked potatoes in the next period. But it was found that the pigs that had been having cooked potatoes would not eat the raw potatoes. Therefore the experiment was stopped at the end of the first period. The pigs fed with the raw potatoes gained 60 pounds each in the 44 days and those fed steamed potatoes gained 67 pounds each, or a gain of 7 pounds in live weight in 44 days due so far as anything in the experiment disclosed to the cooking of the potatoes.

THE MINERAL MATTERS OF MAINE GROWN POTATOES

The ash of potatoes as shown by analysis is about .9 per cent . But part of this will be certain impurities chiefly unburned carbon, and sand and silica that is not removed even by careful washing. In the analysis made by the Maine Station the potato ash has carried about 10 per cent of these impurities. And hence the pure ash of potatoes is about .8 instead of .9 per cent as shown in the table above. The pure ash in the few samples examined at the Maine Station run pretty uniform and carry about 56 per cent potash, 1.8 per cent soda, 1.2 per cent lime, 3.8 per cent magnesia, 14.6 per cent phosphoric acid and 6.2 per cent sulphuric acid. The high potash content of the ash probably explains one of the important functions of potatoes as a food. While the ash functions of food are not clearly known, it is known that potash salts are of high nutritive value, particularly in organic combination.

These mineral matters also have a value in considering the fertilizer needs of the potato plant. The results of the analysis calculated to the water content of the fresh potato are given in the table that follows:

Table Showing the Fertilizer Constituents of Maine Grown Potatoes Calculated to Water Content of Fresh Potatoes

Ammonia	Phosphoric Acid	Potash	Lime
%	%	%	%
.37	.13	.48	.01

If the figures cited from the results of the analysis of Maine grown potatoes are fairly representative, a crop of 250 bushels (about 90 barrels), weighing 150 hundredweight would remove 56 pounds of amonia, 20 pounds of phosphoric acid, 72 pounds of potash, 1½ pounds of lime from the soil.

POTATO POMACE

Potato pomace is the residue which is left in the manufacture of starch from potatoes. The process in general use in this country and Europe briefly stated is as follows:

The tubers after being thoroughly cleansed of all dirt are placed in iron grinding cylinders with saw teeth which lacerate the cells, setting the starch granules free. The ground mass is then washed with cold water on sieves placed over tanks, the starch granules pass through and settle out in the bottom of the tank while the pulp passes off with another portion of the wash water.

The drained pomace carries about 90 per cent of water while potatoes carry less than 80 per cent.

Table Showing the Analysis of Potato Pomace and Potatoes

	Water	Dry matter	Ash	Protein	Fiber	Fat	Nitrogen free extract
On fresh basis	%	%	%	%	%	%	%
Pomace	90.0	10.0	.3	.8	1.1	.1	7.7
Potatoes	78.7	23.3	.9	3.2	.6	.1	18.5
On water-free (dry) basis							
Pomace		100.0	3.1	7.8	11.4	.6	77.1
Potatoes		100.0	3.6	9.5	2.7	.1	84.1

The increase in fiber, loss in water soluble protein matter, and the consequent changes in nitrogen-free extract are the principal differences between the potatoes and the pomace. These differences are more clearly shown on the water-free basis.

As this pulp residue all goes to waste in this country the process is necessarily a wasteful one, and manufacturers have been giving some thought to devising a method of recovering it. The chief obstacle to its use in the fresh condition is the large amount of water it contains. If some method could be devised for cheaply removing the larger part of the water, the dry matter would have considerable value as a feeding stuff. Of course, the material could be fed with 80 to 90 per cent of water present, but in this condition it would keep but a short

time, and as the period for manufacturing starch extends over but a few weeks of the year it would be available for only a very limited time for food. Dried, however, it would keep any length of time.

Table Showing Fertilizing Constituents of Potato Pomace as . Compared with Potatoes

	Water	Ammonia	Phosphoric acid	Potash
On fresh basis	%	%	%	%
Pomace	90.0	.15	.03	.12
Potatoes	78.7	.37	.13	.48
On water-free (dry) basis				
Pomace	0.0	1.52	.25	1.22
Potatoes	0.0	1.58	.56	2.06

When compared on the water-free basis it will be noted that the ammonia is as high in pomace as in the fresh potatoes but that the mineral constituents have been washed out in the making of the starch. And if the pomace is referred back to the original potatoes from which it was made the losses are much greater than shown in the table. As a fertilizer the pomace would not stand much transportation costs and be profitable.

Under present conditions there seems to be no opportunity to conserve this waste product to financial profit.

HIGH RIDGE, MEDIUM RIDGE AND LEVEL CULTURE FOR POTATOES COMPARED*

EXPERIMENTS IN AROOSTOOK COUNTY

Th method of ridge culture is almost universally used by potato growers in Aroostook County. Probably over 90 per cent of the farmers practice what might be called extreme ridge culture. The ridging begins at the time of planting. The planter most used has a plow so contsructed that it makes little more than a mark on the soil unless it is very light, instead of a furrow, then the disks at the rear of the machine cover the seed by throwing up a ridge perhaps 4 inches high so that the seed at the very start is practically on a level with the surface between the rows. A few farmers make a practice of going over the field with a weeder and somewhat flattening the ridge but the number that do this is comparatively few. The method most usually followed is to go between the rows with the cultivator perhaps 8 to 10 days after the potatoes are planted and then as soon as they begin to break the ground go over with the horse-hoe and bury them up also burying the weeds at the same time and thereby raising the height of the ridge. This kind of cultivation is continued until the tops are too large to pass through without injury. By this time an A shaped ridge has been formed about 12 to 15 inches high and, of course, the surface between the rows has been dropped by the continual scraping up of the soil so that the tubers growing in the ridge are considerably above the surface between the rows.

It can be readily seen that in a dry season a field so handled must suffer considerably from lack of moisture. In the rather wet seasons usual to Aroostook County no lack of moisture is felt and the drains between the rows are an advantage rather than an injury, but in an extremely dry season it would seem that the drainage is too great. The ridges being high and narrow dry out very quickly and it would appear therefore the crop must suffer more from lack of moisture than it would if the roots of the plant were below the level as they are when modified level culture is practiced.

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*From Bulletin 188 Maine Station.

In the years 1907, 1908 and 1909 field experiments comparing the shallow planting and high ridge cultivation common in Aroostook County with a deeper planting and a low broad ridge were carried out at Houlton. The three seasons had an abundant water supply. Indeed in 1909 there was more rainfall than the crop needed. Because of the long continued cold wet weather and early frost the yield was reduced materially. The results as given in the following table show no practical advantage of one method over the other so far as yield is concerned.

Table Showing Comparison of Medium Planted, Broad Low Ridge with Shallow Planted High Ridge in Aroostook County. Total Area in Experiments 15 Acres

Method of Culture	Year	Variety	Yield of merchantable potatoes per acre
			Bush.
Medium planted	1907	Green Mountain	333
Medium ridge	1908	Green Mountain	301
	1909	Green Mountain	216
		Average three years	283
Shallow planted	1907	Green Mountain	325
High ridge	1908	Green Mountain	291
	1909	Green Mountain	204
		Average three years	273

EXPERIMENTS IN KENNEBEC COUNTY

The successful growing of potatoes in Aroostook County has greatly stimulated the potato industry over the whole State. The great advance in value of land in Arosotook County has led farmers to sell and go to other parts of the State where land has less value. Both of these facts have led to the adoption of Aroostook County methods of potato growing all over the State. It seemed probable that the less rainfall and not infrequent drouths experienced in the more southern parts of the State might prove unfavorable to growing potatoes with the shallow planting high ridge method of cultivation. With the purchase of Highmoor Farm for the Station an experiment

comparing shallow planting with high ridge cultivation, somewhat deeper planting with a lower, broader ridge, and deep planting with as level cultivation as practicable, was begun. This was continued through four years with two varieties of potatoes. The results of the exepriment are here reported. The deep planted lots were planted at a depth of 5 inches, the medium at 3½ inches and the shallow at 2 inches.

Full data as to the planting, cultivation, spraying and harvesting of the crop were kept each season. But in an experiment of this type it does not seem wise to use space in reporting details that, while they are important in showing that the crop was carefully grown, have little agricultural significance beyond that fact.

The yields for the four years are given in the table which follows:

Table Showing Comparison of Deep Planted, Level Culture, Medium Planted, Medium Ridge and Shallow Planted High Ridge at Highmoor Farm (Kennebec County). Total Area in Experiments 16 1-2 Acres

Method of Culture	Year	Variety	Yield per acre of merchantable potatoes
			Bush.
Deep planted	1910	Green Mountain	365
Level culture	1911	Irish Cobbler	166
	1912	Irish Cobbler	15
	1913	Green Mountain	359
		Average Green Mountain	360
		Average Irish Cobbler	163
		Average four years	261
Medium planted	1910	Green Mountain	436
Medium ridge	1911	Irish Cobbler	170
	1912	Irish Cobbler	162
	1913	Green Mountain	334
		Average Green Mountain	385
		Average Irish Cobbler	166
		Average four years	276
Shallow planted	1910	Green Mountain	372
High ridge	1911	Irish Cobbler	130
	1912	Irish Cobbler	147
	1913	Green Mountain	277
		Average Green Mountain	325
		Average Irish Cobbler	139
		Average four years	232

The season of 1910 was favorable for a maximum crop as the rainfall was ample and the growing season greatly prolonged by frost keeping off until October. The seasons of 1911 and 1912 were not so favorable and 1913 was particularly unfavorable, although the rainfall in August was greater than the average and saved the crop from the damage that threatened from the dry July.

The time required for planting was the same on all of the plots. The planting, spraying and harvesting were the same for all of the plots with the exception that on the deep planted it was necessary to use four horses on the digger. The deep planted required less hours of cultivation; the medium planted the most. A man and team for cultivating were on the deep plots 26 hours, on the medium 39 hours and on the shallow 35 hours per acre.

There was not much difference in the difficulties of digging between the shallow planted and the medium planted. The deep planted required four horses instead of two on the digger, and a good deal of care was necessary to be sure that the digger was sufficiently deep in the ground to prevent cutting the tubers.

CONCLUSIONS

In the three years experiments comparing the usual method practiced in Aroostook County with deeper planted seed and a lower, broader ridge than is commonly used there showed that so far as yield was concerned there is nothing to choose in that locality between the two methods.

The deep planted and medium planted gave practically the same yields at Highmoor Farm with the advantage (though within experimental error) in favor of the medium planted. The medium planted and medium ridge gave considerably better yields at Highmoor Farm than the shallow planted and high ridge. The medium ridge is cultivated as cheaply as the shallow ridge and is harvested nearly as easily. The deep planted are cultivated at less cost than either of the two other methods but are far more difficult to harvest.

The results indicate that for Aroostook County the shallow planted high ridge is well suited to the climatic conditions.

And they also clearly indicate that for the lower counties in the State with their lesser rainfall during the growing season the medium planted with the broad low ridge cultivation is preferable to either of the others.

POTATOES GROWN AT AROOSTOOK FARM ON FERTILIZERS CONTAINING AMMONIA (NITROGEN) IN DIFFERENT FORMS

A few years ago there was quite a general failure of the crop of potatoes in Aroostook County where a certain brand of fertilizer was used. This fertilizer was analyzed by the Station chemists and found to be high grade. While it was not quite up to its guaranty in some particulars it did carry enough nitrogen, phosphoric acid and potash to more than grow a good crop of potatoes. This fertilizer carried none of its nitrogen in the form of nitrate of soda, but it was all in the form of sulphate of ammonia and high grade organic materials. This led to the stronger reaffirming of the position which the Station had taken relative to the use of nitrate nitrogen in the potato crop. In earlier publications it has been pointed out that the potato makes its demands for nitrogen early in the season and that in the cold, late springs so common in Aroostook County, the crop demands that part of the nitrogen should be immediately available. For this reason the Station has strongly urged that about one-third of the nitrogen in a potato fertilizer be nitrate nitrogen.

In the process of making gas and coke from coal there is developed a large amount of sulphate of ammonia, which in many coke and gas plants is still going to waste. In some plants this now is being conserved and many thousand tons of sulphate of ammonia are thus obtained each year. With the increasing use of high grade organic nitrogen for food of animals, the price of tankage has been going higher and higher year by year. It is, of course, desirable, if it can be done, that as much as possible of this sulphate of ammonia, which is a comparatively cheap source of nitrogen, be used in Maine fertilizers.

Because of these facts, arrangements were made to begin in 1914 a series of experiments to run over a period of several

years. The "base" which was used in these goods was made by the wet process, whereby nitrogen from rather low grade goods is made as available as from high grade goods. The available phosphoric acid was furnished in the form of acid phosphate and the potash in the form of sulphate of potassium. The fertilizer was free from chlorides so as to preclude the possibility of the formation of poisonous ammonium chloride. The base carried approximately one-third of the nitrogen that went into the formula. The remainder of the nitrogen was furnished in the form of nitrate of soda and sulphate of ammonia, as indicated in the following plan:

Plot 1. Basal mixture and 2-3 of the nitrogen in form of nitrate of soda.

Plot 2. Basal mixture and 2-3 of the nitrogen in form of sulphate of ammonia.

Plot 3. Basal mixture and 1-3 of the nitrogen in form of nitrate of soda and 1-3 in form of sulphate of ammonia.

Plot 4. Basal mixture and 1-3 of the nitrogen in form of high grade organic and 1-3 in form of nitrate of soda.

Plot 5. Basal mixture and 1-3 of the nitrogen in form of high grade organic and 1-3 in form of sulphate of ammonia.

In each case the finished fertilizer analyzed 5 per cent ammonia, 8 per cent available phosphoric acid and 7 per cent potash. In each year the fertilizer has been applied in the planter at the rate of 1500 pounds per acre. Other than the fertilizer used the plots were planted, cultivated, sprayed and cared for in all particulars alike. In each year duplicate plots each about one-half acre in area have been grown with each mixture.

The results for 1914 and 1915 are reported in detail in Bulletin 246, those for 1916 in Bulletin 260 and those for 1917 in Bulletin 269. The detailed results for the experiment in 1918 are given in the table that follows.

Growing Potatoes with Application of Different forms of Nitrogen Yield of Potatoes Per Acre in 1918

Plot No.	Treatment	Merchantable			Culls		
		Cwt.	Bbls.	Bus.	Cwt.	Bbls.	Bus.
959	⅔ Nitrate of Soda	126.7	76.8	211.2	5.0	3.0	8.2
960	⅔ Nitrate of Soda	112.7	68.3	187.7	6.2	3.8	10.4
Average		119.7	72.6	199.5	5.6	3.4	9.3
951	⅔ Sulphate of Ammonia	134.3	81.4	223.9	5.1	3.1	8.5
961	⅔ Sulphate of Ammonia	149.5	90.6	249.1	4.6	2.8	7.7
Average		141.9	86.0	236.5	4.9	3.0	8.1
952	⅓ Nitrate of Soda	123.2	74.7	205.4	5.6	3.3	9.1
962	⅓ Sulphate of Ammonia	159.0	96.3	264.8	4.2	2.6	7.2
Average		141.1	85.5	235.1	4.9	3.0	8.1
953	⅓ Nitrate of Soda	125 8	76.2	209.5	5.3	3.2	8.8
963	⅓ Organic	129.2	78.3	215.3	5.1	3.1	8.5
Average		127.5	77.3	212.4	5.2	3.2	8.7
954	⅓ Sulphate of Ammonia	122.1	74.1	203.8	5.6	3.3	9.1
964	⅓ Organic	126.2	76.5	210.3	5.5	3.3	9.1
Average		124.2	75.3	207.1	5.6	3.3	9.1

Growing Potatoes with Application of Different forms of Nitrogen in 1914, 1915, 1916, 1917, and 1918. Yield in Hundredweight Per Acre

Treatment	1914	1915	1916	1917	1918	Average 5 yrs.
⅔ Nitrate of Soda	198	186	231	140	120	175
⅔ Sulphate of Ammonia	182	198	231	142	142	179
⅓ Nit. Soda ⅓ Sulph. Ammon.	191	196	226	145	141	180
⅓ Nit. Soda ⅓ Organic	198	183	231	138	128	176
⅓ Sulph. Ammon. ⅓ Organic	182	180	236	143	124	173

From the results of these trials it appears that there is little choice in the form that nitrogen is used on potatoes in Aroostook County and that the supposition made in the first paragraph of this report has not held true at Aroostook Farm in the past 5 years.

As the results for the 5 years tell the same story each year the experiment will not be continued further. In 2 of these years the seasons have been cold and as unfavorable to bacterial action as is likely to occur. The supposed quicker acting nitrate of soda gave no better yields in those cold unfavorable seasons than was had with sulphate of ammonia as the source of the nitrogen. Experiments made by the Station on the John

Watson farm Houlton a number of years ago in which home mixed fertilizers were compared with standard commercial brands of about the same analysis indicated very clearly that not more than half of the nitrogen in a fertilizer should be derived from the organic sources unless it was in a very easily broken down material. Even good tankage when used in larger amounts had a tendency to prolong the top growth until too late for the short growing season of Aroostook County to allow time to develop the desired tuber growth. The formula used by the Station in its potato growing is a fairly good one for general use in the County. In this formula one-third of the nitrogen is from nitrate, one-third from sulphate of ammonia, and one-third from high grade organic sources.

EFFECT OF OMITTING POTASH FERTILIZATION UPON THE POTATO CROP

Since the introduction of potash in commercial fertilizers in the early seventies of the last century, many experiments have been made and many treatises written showing the value of potash in crop growing. The experimental data on growing crops without potash are very few.

Potatoes are the chief cash crop grown in Maine. Foreseeing the possibility that, with the continuance of the war, very little potash would be available for fertilizers, the Maine Agricultural Experiment Station began in 1915, at Aroostook Farm, a series of experiments to determine the effect of different amounts of potash. The results obtained in 1915 were published in Bulletin 246; those for 1916 were published in Bulletin 260, and those for 1917 in Bulletin 269.

Five different mixtures were used. In each case the fertilizers contained 5 per cent of ammonia of which one-third was in the form of nitrate of soda, and 8 per cent of available phosphoric acid. The potash varied as follows: On one plot there was no potash. The next plot also had no potash but common salt was mixed with the fertilizer at the rate of 300 pounds of salt per acre. The salt was used to see whether this would aid in freeing potash already in the soil and not in a form available for plant food. The fertilizer for the remaining 3 plots contained respectively 3 per cent, 5 per cent and 8 per

cent potash. In each case the fertilizer was applied at the time of planting, at the rate of 1500 pounds per acre. Each plot was slightly less than one-half acre in area. The area of each plot was obtained by actual measurement and the yields are based on the weighed potatoes from each plot. Norcross potatoes were used for seed. Other than in respect to potash all plots were treated exactly alike. The land used for this experiment had been in sod for 2 years. The experiment was made in duplicate and is separately reported.

Yield Per Acre in No Potash Experiment with Potatoes, 1918

Plot No.	Amount of Potash	Merchantable			Culls		
		Cwt.	Bbls.	Bus.	Cwt.	Bbls.	Bus.
	SERIES 1						
945	None	83.5	50.6	139.0	6.7	4.1	11.0
946	None + Salt	88.7	53.8	147.9	6.4	3.9	10.7
947	3 per cent Potash	94.2	57.1	157.0	5.9	3.6	9.9
948	5 per cent Potash	124.7	75.5	207.6	5.4	3.3	9.1
949	7 per cent Potash	133.5	80.9	222.5	4.9	3.0	8.2
	SERIES 2						
955	None	123.1	74.6	205.2	5.6	3.4	9.4
956	None + Salt	130.0	78.8	216.7	5.4	3.3	9.1
957	3 per cent Potash	128.4	77.8	213.9	5.8	3.5	9.6
958	5 per cent Potash	137.2	83.2	228.8	4.9	3.0	8.2
959	7 per cent Potash	133.7	81.0	222.7	6.2	3.8	10.4

The plots in series 1 were planted May 11 and 13. On June 19, after they had reached a height of about 6 inches, they were killed to the ground by a heavy frost. Plots 948 and 949 had been cultivated that day and the plants were well covered with soil. The plants on plots 945, 946, and 947 suffered the most and did not fully recover during the season. They had a tendency to branch and make spindling growth. The 2 other plots, while badly injured, practically recovered as the season progressed.

The yields for the 4 years 7 series are summarized in the table that follows.

No Potash Experiment with Potatoes. 1915-1916-1917-1918. Yield in Hundredweight Per Acre

Amount of Potash	1915	1916		1917		1918		
		Series 1	Series 2*	Series 1	Series 2	Series 1	Series 2	Average
None	182	172	198†	131	140	84†	123	150
None + Salt		193	200†	136	144	89†	130	140
3 per cent Potash	191	254	193†	135	150	94†	128	172
5 per cent Potash	191	254	191†	131	157	125†	137	174
7 per cent Potash	198	244	226†	139	160	134†	134	175

*In this series the potatoes followed potatoes. †Omitted from average.

From the results of these 5 trials in 4 seasons on sod land the following conclusions may be drawn: The addition of 300 pounds of common salt per acre made a small but uniform increase in yield. Omitting the yields for 1915 in which there was no salt plot, the average yield for the plots without potash or salt was 140 hundredweight and for the plots without potash but with common salt added the yields averaged 151 hundredweight. The addition of as little as 45 pounds (1500 pounds of 3 per cent goods) per acre of potash uniformily increased the yield of potatoes and profitably. On the Caribou loam of Aroostook Farm soil nothing was gained by a larger application. Good yields were obtained without any potash. From the soil test experiment on Caribou loam on this farm it appears to be the case that nitrogen and not potash is the limiting factor in potato production on this soil on this farm. "Potash hunger" did not manifest itself in either year in these trials.